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Contents

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Surveillance Trends

Relationship Between Body Mass Index and Musculoskeletal System and Connective Tissue Disorders, US Army, 1990-1999

Body mass index (BMI) is a standardized measure of relative weight to height. The National Heart, Lung, and Blood Institute (NHLBI) of the National Institutes of Health has published guidelines for using BMIs to categorize soldiers as "underweight" (<18.5), "normal weight" (18.5 to 24.9), "overweight" (25.0 to 29.9) or "obese" (>30.0).[1] Obesity generally and high BMIs specifically have been associated with adverse health effects,[1] including exercise-related injuries[2-4] and osteoarthritis.[5-7]

Musculoskeletal and connective tissue (MS/CT) disorders may result from acute, recurrent, or repetitive injuries to bones, joints, tendons, or ligaments. MS/CT disorders are among the leading causes of morbidity and lost duty time in the US Army.[8-9] The US military services use height-weight standards to restrict entry to and continuation on active service. This study was designed to assess relationships between MS/CT-related morbidity and BMI in the limited BMI range of active duty soldiers.

Methods. The study population included all soldiers who served on active duty between 1990 and 1999 and completed at least one Health Risk Appraisal (HRA). If a soldier completed more than one HRA, the earliest record was used in the analysis. All medical encounters with primary MS/CT disorder diagnoses (ICD-9 codes: 710-739) that occurred within 1 year before or after an HRA record date were included in the analysis. Data for inpatient admissions (for the years 1990-1999) and outpatient visits (1998-1999) were analyzed separately.

BMIs were computed as weight (in kilograms) divided by height (in meters) squared. Rates of medical encounters were computed as the number of MS/CT disorders per person-years of active service. Confidence intervals (95%) were calculated based on the Poisson distribution. All data for analysis were derived from the Defense Medical Surveillance System.

Results. Of 1,400,687 soldiers who served on active duty between 1990 and 1999, 387,536 (27.7%) completed at least one HRA. These soldiers comprised the study group and were similar demographically to the general Army population. "Underweight" soldiers accounted for 4.0% of the study group; "normal weight" soldiers comprised

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Inquiries regarding content or material to be considered for publication should be directed to the editor, Army Medical Surveillance Activity, Bldg. T-20, Rm 213, 6825 16th St., NW, Washington DC, 20307-5000. E-mail: editor@amsa.army.mil

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Figure 1. Distribution of body mass indexes for active duty soldiers, 1990-1999

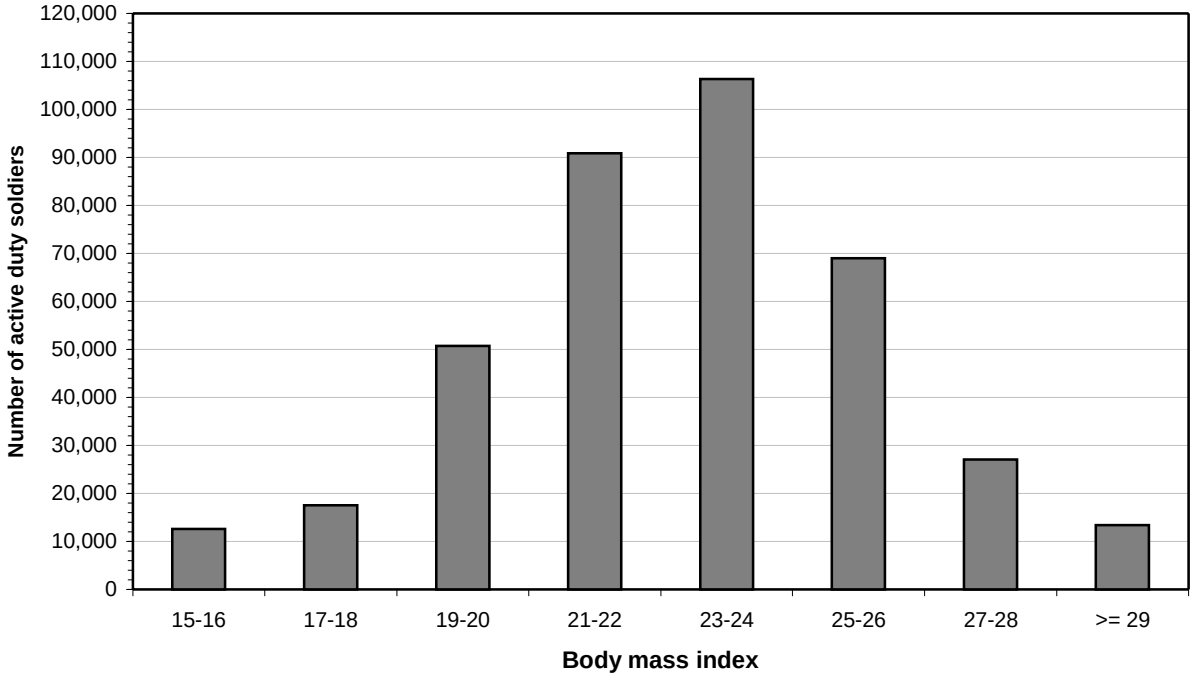


Figure 2. Hospitalizations with musculoskeletal/connective tissue disorder diagnoses, by body mass index, AD Army, 1990-1999

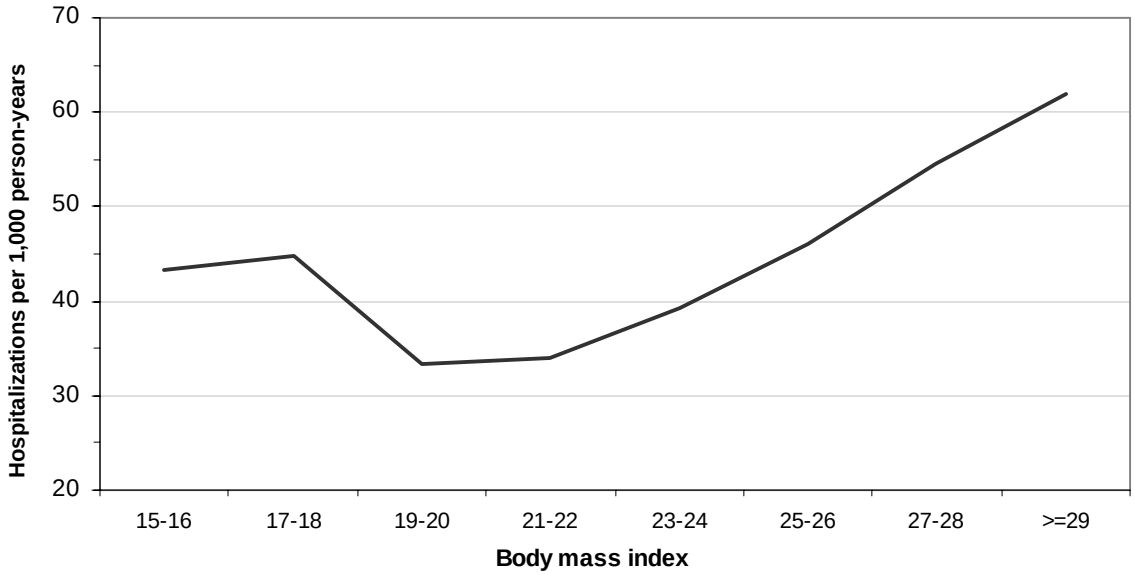


Table I. Sentinel reportable events, US Army medical treatment facilities[1] Cumulative events for all beneficiaries, calendar year through July 31, 1999 and 2000[2]

Reporting Facility	Number of reported events[3]		Environmental				Food-and Water-borne							
			Cold		Heat		Campylobacter		Giardia		Salmonella		Shigella	
	Cum. 1999	Cum. 2000	Cum. 1999	Cum. 2000	Cum. 1999	Cum. 2000	Cum. 1999	Cum. 2000	Cum. 1999	Cum. 2000	Cum. 1999	Cum. 2000	Cum. 1999	Cum. 2000
NORTH ATLANTIC RMC														
Walter Reed AMC, DC	70	57	-	-	-	-	2	-	1	1	1	2	-	2
Aberdeen Prov. Grd., MD	20	11	-	-	-	-	-	-	-	-	-	-	-	-
FT Belvoir, VA	49	48	-	-	2	4	1	5	3	-	1	1	1	-
FT Bragg, NC	553	676	8	-	77	95	2	-	-	-	2	2	-	-
FT Drum, NY	116	114	15	9	3	1	1	-	-	-	-	-	-	-
FT Eustis, VA	78	106	1	-	3	7	-	1	-	-	1	1	-	-
FT Knox, KY	113	86	1	-	11	9	-	-	-	-	1	-	-	-
FT Lee, VA	90	132	-	-	0	-	-	-	-	-	-	-	-	-
FT Meade, MD	33	27	-	-	0	-	-	-	-	-	-	-	-	-
West Point, NY	14	32	-	1	1	-	-	-	-	-	-	3	-	-
GREAT PLAINS RMC														
Beaumont AMC, TX	107	126	-	-	5	6	-	-	-	-	1	2	-	2
Brooke AMC, TX	190	107	-	-	1	4	-	-	-	1	2	2	-	1
FT Carson, CO	324	274	2	-	-	-	2	-	2	-	-	-	1	-
FT Hood, TX	384	819	-	1	1	17	-	-	1	-	1	-	-	-
FT Huachuca, AZ	24	18	-	-	-	1	-	-	-	-	-	-	-	-
FT Leavenworth, KS	8	4	-	-	-	0	1	-	1	1	-	1	-	-
FT Leonard Wood, MO	75	76	3	3	2	5	-	-	-	-	-	-	-	-
FT Polk, LA	103	120	0	-	-	0	-	-	-	-	-	-	-	-
FT Riley, KS	132	115	1	22	0	1	-	-	-	-	-	-	-	-
FT Sill, OK	124	150	-	-	1	6	-	-	-	-	-	-	-	-
SOUTHEAST RMC														
Eisenhower AMC, GA	82	98	1	-	2	-	-	-	-	-	-	1	-	-
FT Benning, GA	145	129	-	-	39	38	-	-	1	-	1	1	2	-
FT Campbell, KY	175	199	2	2	7	1	6	-	-	2	1	4	7	2
FT Jackson, SC	191	234	-	-	-	-	-	-	-	-	-	-	-	-
FT Rucker, AL	29	30	-	-	1	1	-	-	-	-	-	-	-	-
FT Stewart, GA	225	279	-	-	1	26	-	-	-	-	-	-	-	-
WESTERN RMC														
Madigan AMC, WA	276	298	-	-	-	-	-	3	1	1	-	-	1	-
FT Irwin, CA	13	21	-	-	-	-	-	-	-	-	-	-	-	-
FT Wainwright, AK	71	41	42	4	-	-	-	-	-	-	-	-	-	-
OTHER LOCATIONS														
Tripler, HI	96	289	-	-	-	3	2	11	2	2	1	3	-	-
Europe	191	785	3	5	-	-	4	3	-	1	2	7	1	-
Korea	207	249	8	2	-	-	-	-	-	-	-	1	-	-
Total	**4,308**	**5,750**	**87**	**49**	**157**	**225**	**21**	**23**	**12**	**9**	**15**	**31**	**13**	**7**

1. Main and satellite clinics.
2. Events reported by August 7, 1999 and 2000.
3. Tri-Service Reportable Events, Version 1.0, July 1999.

Table I. (Cont'd) Sentinel reportable events, US Army medical treatment facilities[1] Cumulative events for all beneficiaries, calendar year through July 31, 1999 and 2000[2]

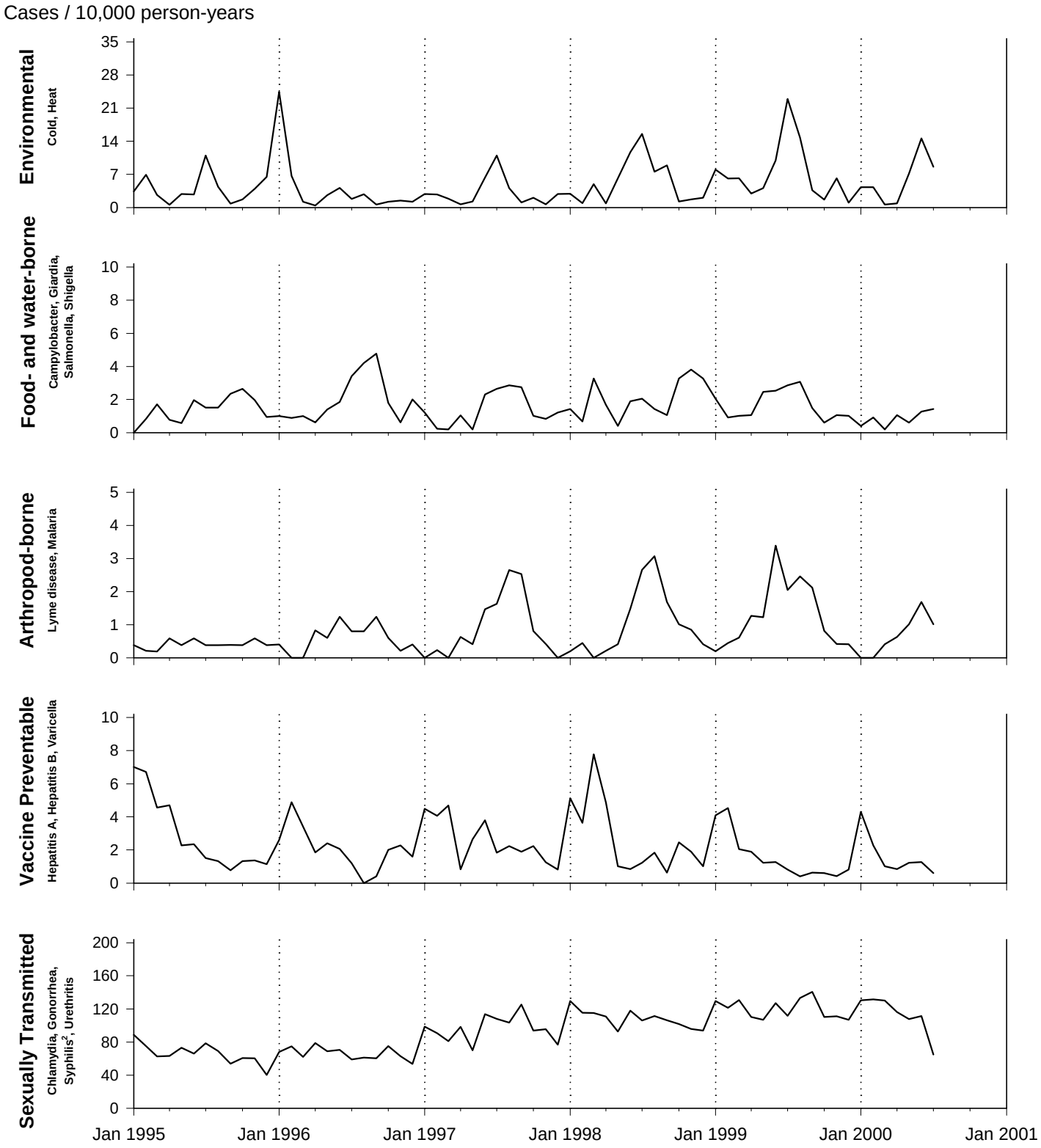
Arthropod-borne				Vaccine Preventable						Sexually Transmitted							
Lyme Disease		Malaria		Hepatitis A		Hepatitis B		Varicella		Chlamydia		Gonorrhea		Syphilis[d]		Urethritis	
Cum. 1999	Cum. 2000	Cum. 1999	Cum. 2000	Cum. 1999	Cum. 2000	Cum. 1999	Cum. 2000	Cum. 1999	Cum. 2000	Cum. 1999	Cum. 2000	Cum. 1999	Cum. 2000	Cum. 1999	Cum. 2000	Cum. 1999	Cum. 2000
-	1	3	-	-	-	-	-	3	2	40	24	9	9	3	1	1	-
-	2	-	-	-	-	-	-	1	1	7	6	10	-	-	2	2	-
-	-	-	-	-	-	-	1	-	1	30	25	10	6	-	2	-	-
1	-	3	3	-	-	-	-	1	3	211	205	126	128	2	1	120	238
-	-	1	-	-	-	-	-	5	5	54	68	32	28	-	-	3	2
-	1	-	-	-	-	1	-	1	1	52	77	17	16	-	-	-	-
-	-	-	-	-	-	-	1	1	5	68	55	30	15	-	1	-	-
-	-	-	-	-	1	-	-	-	-	70	102	17	29	3	-	-	-
-	-	-	-	-	-	-	-	1	-	28	17	2	4	-	-	-	1
2	3	-	-	-	-	-	-	1	2	9	17	1	6	-	-	-	-
-	-	1	-	-	-	-	-	2	1	76	86	10	20	-	-	9	4
-	-	-	2	-	-	1	-	2	2	69	61	26	18	-	2	1	-
-	-	-	1	-	-	1	-	1	-	227	215	36	36	-	-	49	22
-	-	2	-	-	-	-	1	2	2	204	400	67	172	2	-	100	225
-	-	-	-	1	-	-	-	-	-	20	13	2	4	-	-	-	-
-	-	-	-	-	-	-	-	-	-	5	1	1	1	-	-	-	-
-	-	1	-	-	-	-	-	8	13	34	28	14	20	1	-	8	6
-	-	-	-	-	-	-	-	-	-	80	107	19	13	2	-	-	-
-	-	-	-	-	-	-	-	-	-	93	54	38	35	-	1	-	-
-	1	-	-	-	-	6	-	6	3	60	85	30	25	-	-	19	25
-	2	-	3	-	-	2	3	1	2	67	78	6	5	-	-	-	-
-	-	-	3	1	-	-	1	1	6	40	43	37	32	-	2	-	-
-	-	5	5	-	-	-	1	-	2	91	94	56	82	-	1	-	-
-	-	-	-	-	-	-	-	4	3	145	208	30	23	6	-	-	-
-	-	-	1	-	-	-	-	-	-	19	22	9	6	-	-	-	-
-	-	3	-	-	-	-	-	4	-	59	80	47	55	-	-	111	115
-	-	1	1	-	-	-	1	-	-	167	165	38	32	-	-	61	82
-	-	-	-	-	-	2	-	-	1	9	16	2	4	-	-	-	-
-	-	1	-	-	-	1	-	2	-	20	36	4	1	-	-	-	-
-	-	1	-	-	-	-	2	-	1	68	210	21	40	-	-	-	1
-	-	1	-	-	-	2	6	1	9	146	600	24	142	-	1	1	1
-	-	9	1	-	-	9	1	-	1	155	206	7	15	11	10	-	6
3	**10**	**32**	**20**	**2**	**1**	**25**	**18**	**48**	**66**	**2,423**	**3,404**	**778**	**1,022**	**30**	**24**	**485**	**728**

4. Primary and Secondary.

Note: Completeness and timeliness of reporting varies by facility.

Source: Army Reportable Medical Events System.

Figure I. Sentinel reportable events (grouped), active duty soldiers, January 1995-August 2000[1]



1. Events reported by August 7, 2000.
2. Primary and Secondary.

Source: Army Reportable Medical Events System.

Table 1. Top 10 musculoskeletal and connective tissue disorder diagnoses, active duty soldiers who completed a Health Risk Appraisal, 1990-1999

Hospitalizations, 1990-1999				Ambulatory visits, 1998-1999			
ICD-9 code	Diagnosis	N	%	ICD-9 code	Diagnosis	N	%
717	Internal derangement of knee	9,297	24.6	724	Other and unspecified disorders of back	197,660	24.6
718	Other derangement of joint	4,213	11.2	719	Other and unspecified disorders of joint	174,548	21.7
727	Other disorders of synovium, tendon, and bursa	3,767	10.0	726	Peripheral enthesopathies and allied syndromes	109,028	13.6
722	Intervertebral disc disorders	3,426	9.1	729	Other disorders of soft tissues	69,905	8.7
726	Peripheral enthesopathies and allied syndromes	2,612	6.9	717	Internal derangement of knee	43,657	5.4
735	Acquired deformities of toe	2,470	6.5	723	Other disorders of cervical region	30,645	3.8
733	Other disorders of bone and cartilage	2,188	5.8	727	Other disorders of synovium, tendon, and bursa	30,183	3.8
719	Other and unspecified disorders of joint	1,884	5.0	728	Disorders of muscle, liagament, and fascia	29,865	3.7
715	Osteoarthrosis and allied disorders	1,505	4.0	722	Intervertebral disc disorders	22,553	2.8
724	Other and unspecified disorders of back	1,492	4.0	715	Osteoarthrosis and allied disorders	16,488	2.1
All musculoskeletal/connective tissue diagnoses		37,736	100.0	All musculoskeletal/connective tissue diagnoses		803,930	100.0

Continued from page 2

approximately half (52.6%); more than a third (39.9%) were in the "overweight" category; and 3.5% were classified as "obese" (figure 1, page 3).

During the period, there were 37,736 hospitalizations and 803,930 ambulatory visits of soldiers in the study group for MS/CT-related disorders. The largest number of hospitalizations were for "internal derangements of the knee" (n=9,297, 24.6%). Nearly half of the ambulatory visits were for "other and unspecified disorders of the back" (n=197,660, 24.6%) or "other and unspecified disorders of joints" (n=174,548, 21.7%) (table 1).

Overall, there was a "J-shaped" relationship between MS/CT-related hospitalization rates and BMI; that is, rates were intermediate among soldiers with the lowest BMIs (<18), lowest among soldiers with intermediate (19-22) BMIs, and highest among soldiers with the highest BMIs (figure 2, page 3).

Previous summaries of Armywide data have shown that MS/CT-related hospitalization and ambulatory visit rates vary in relation to gender and age.[8-9] Thus, further assessments were conducted in age- and gender-defined subgroups. Among males, there were "J-shaped" relationships between hospitalization rates and BMIs in all age groups (figure 3, page 8); however, among females, hospitalization rates tended to be more linearly related to BMI—from relatively flat in relation to BMI in the youngest age group to relatively steeply increasing with increasing BMI in the oldest (figure 3). Finally, in every age group in both genders, the highest hospitalization rates were among soldiers in the highest BMI subgroup (>29) (figure 3); in fact, soldiers with BMIs >29 compared to those with BMIs of 19-20 were from 1.3 to 2.1 times more likely to be hospitalized for an MS/CT disorder.

Ambulatory visit rates varied little in relation to BMI in the youngest age groups of both genders. Among soldiers between 25 and 34, however, there were "J-shaped" relationships between ambulatory visit rates and BMIs; the lowest rates were among those with BMIs of 19-20 and the highest among

Text continued on page 10

Figure 3. Rates of hospitalization (and 95% confidence intervals) for musculoskeletal disorders, by BMI, in age and gender subgroups, active duty soldiers, 1990-1999

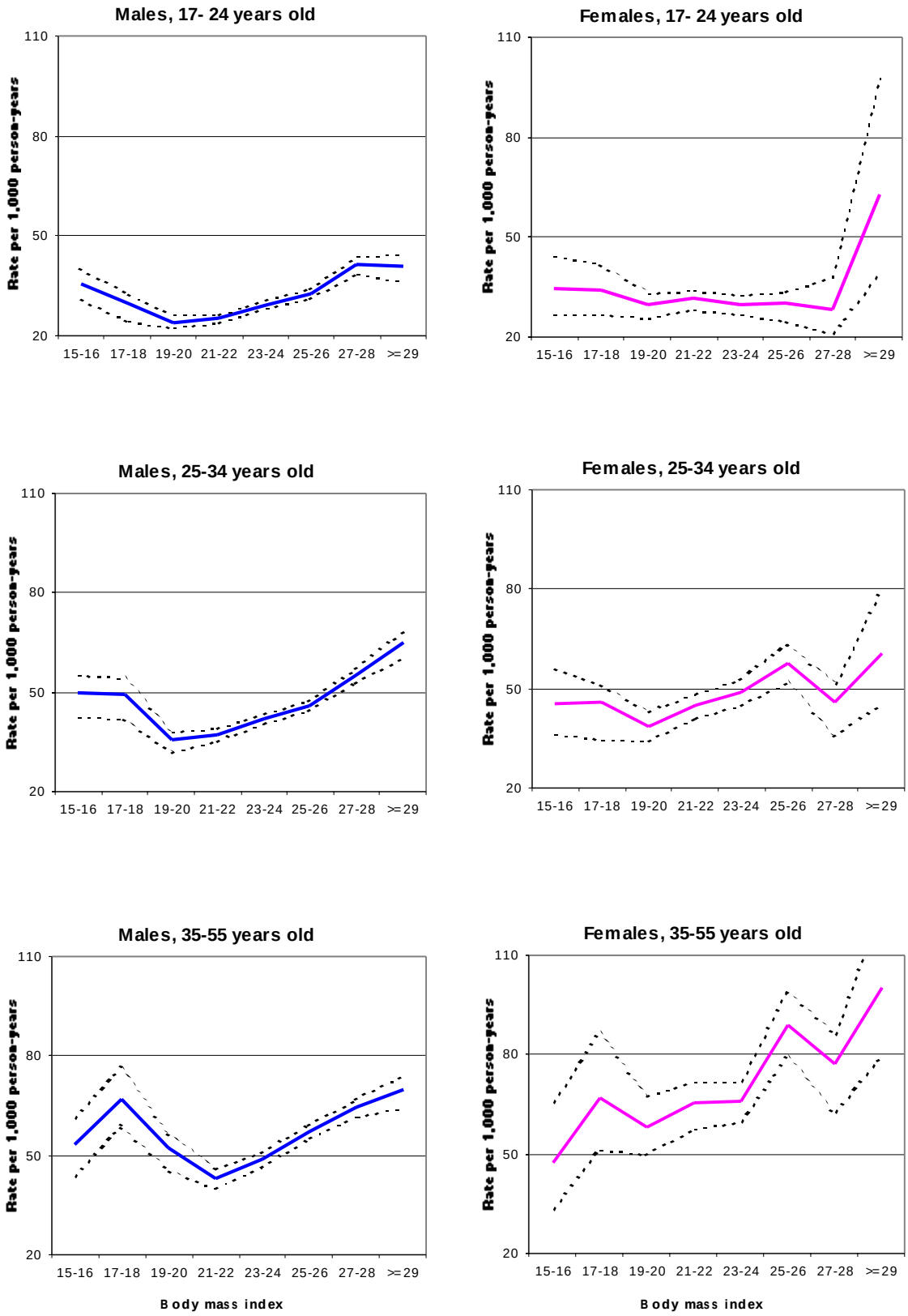
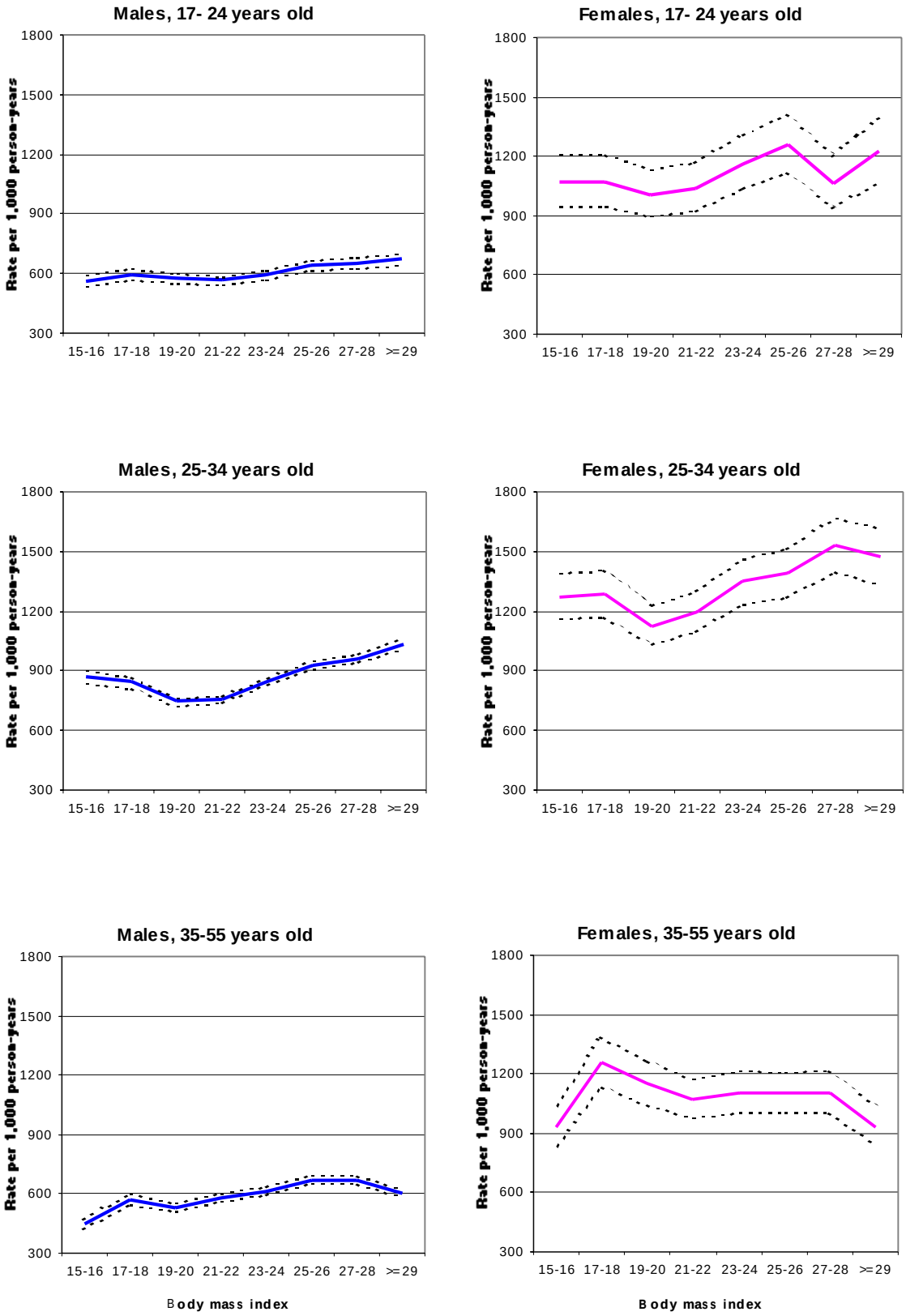


Figure 4. Rates of ambulatory visits (and 95% confidence intervals) for musculoskeletal disorders, by BMI, in age and gender subgroups, active duty soldiers, 1998-1999



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those with BMIs >29. Finally, among soldiers older than 34, rates were lowest among those with the lowest BMIs (<16) and relatively flat in relation to BMI otherwise (figure 4, page 9).

Editorial comment. These results suggest that in young, healthy, and active young adults, risks of musculoskeletal and connective tissue disorders significantly vary in relation to body mass. Even in the relatively narrow body mass range of active duty soldiers, MS/CT risks generally increased with BMIs above 21-22. With control of effects of age and gender, soldiers with BMIs above 29 were at 30% to 110% increased risk of an MS/CT hospitalization compared to their counterparts with BMIs of 21-22. Of note, the increase in risk attributable to higher BMIs seemed to increase with age. Finally, nominally "underweight" (BMI<18.5) male soldiers had higher rates of MS/CT hospitalizations than their "normal weight" counterparts. The data suggest that nutrition, fitness, and weight control efforts—even among soldiers who meet height-weight standards—may have significant effects on reducing morbidity and lost duty time.

Analysis and report provided by Samuel Washington, MPH, Data Analysis Group, Army Medical Surveillance Activity.

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Surveillance Trends

Assault-Related Hospitalizations, Active Duty Military Personnel, 1990-1999

Injuries sustained in assaults (e.g., fights, brawls) are a significant source of preventable morbidity among active duty military personnel. Risk factors for assault-related injuries include alcohol consumption and young age, as well as being male.[1-5] This report describes the nature and magnitude of assault-related hospitalizations in the active duty military population. In addition, it documents rates of acute alcohol intoxication at the time of assault-related hospitalizations.

Methods. Standard inpatient data records maintained in the Defense Medical Surveillance System were searched to identify all hospitalizations among active duty servicemembers from January 1990 through December 1999 whose records indicated the hospitalization resulted from an assault. This characterization was based on NATO Standardization Agreement (STANAG) external cause of injury codes (970-979). [6] Hospitalizations related to "adult physical abuse" or "battered person syndrome" (ICD-9 code 995.81) were not included because they were outside the scope of this analysis.

Results. During the 1990s, approximately 1 of every 8 non-pregnancy-related hospitalizations of active duty military personnel were due to injuries (ICD-9 800-999). More than 5% (n=8,778) of all injuries that resulted in hospitalizations were incurred during assaults. Three hundred forty-three individuals (4.1%) had multiple assault-related hospitalizations. Nearly a quarter (24.1%, n=2,035) of servicemembers with assault-related hospitalizations were separated from military service within 1 year of their hospitalizations (compared to 10.5% of servicemembers who were hospitalized overall). Six

Figure 1. Crude rates of assault-related hospitalizations, in demographic- and military-defined subgroups, active duty, US Armed Forces, 1990-1999

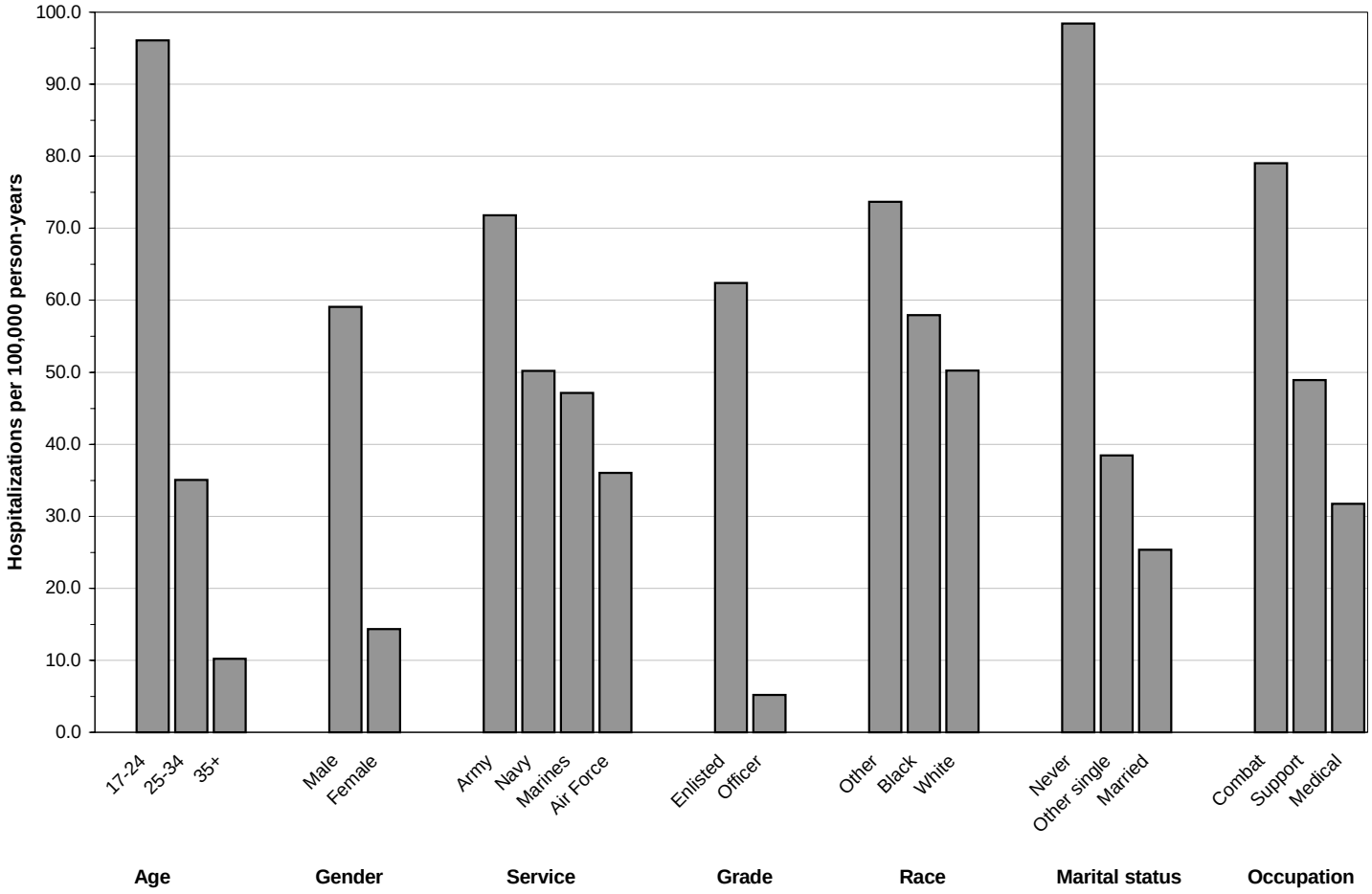


Table 1. Rates of assault-related hospitalizations, active duty military, 1990-1999

Characteristics	Male								Female								Total	
	17-24		25-34		35+		Subtotal		17-24		25-34		35+		Subotal			
	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate	N	Rate
Total	6,010	107.7	2,129	38.2	350	10.9	8,489	59.1	169	19.8	105	13.2	15	4.1	289	14.3	8,778	53.6
Service																		
Army	2,727	141.4	1,020	52.9	155	14.6	3,902	79.3	81	26.4	65	21.7	9	7.1	155	21.2	4,057	71.8
Marines	522	51.3	258	54.2	53	24.7	833	48.8	11	21.0	1	3.8	1	11.4	13	14.8	846	47.1
Navy	1,523	92.6	632	39.8	124	13.9	2,279	55.2	36	15.4	17	8.6	4	4.3	57	10.9	2,336	50.2
Air Force	1,238	125.1	219	13.9	18	1.7	1,475	40.9	41	15.9	22	8.0	1	0.7	64	9.5	1,539	35.9
Grade																		
Officer	25	14.0	76	7.6	24	2.3	125	5.7	1	2.8	3	1.9	2	1.6	6	1.9	131	5.2
Enlisted	5,985	110.8	2,053	44.9	326	14.9	8,364	68.7	168	20.6	102	16.0	13	5.5	283	16.7	8,647	62.4
Race																		
White	4,234	101.2	1,352	33.5	213	9.0	5,799	54.8	87	16.3	47	10.0	9	3.8	143	11.5	5,942	50.2
Black	1,159	117.2	536	47.9	96	16.8	1,791	66.9	71	28.3	48	17.7	5	4.7	124	19.7	1,915	57.9
Other	617	150.5	241	57.4	41	15.0	899	81.5	11	16.0	10	18.2	1	4.3	22	15.0	921	73.7
Marital Status																		
Single	5,043	127.2	911	76.3	68	32.1	6,022	112.1	115	20.5	32	12.5	3	3.6	150	16.7	6,172	98.4
Married	925	59.4	1,100	26.6	246	8.7	2,271	26.6	52	19.3	62	13.4	9	4.0	123	12.9	2,394	25.3
Other	42	110.5	118	56.0	36	24.1	196	49.3	2	10.5	11	14.4	3	5.2	16	10.4	212	38.4
Occupation																		
Combat	1,920	139.3	600	42.7	88	23.1	2,608	82.4	10	13.2	2	3.7	0	0.0	12	7.9	2,620	79.0
Support	3,864	98.7	1,414	37.3	237	9.3	5,515	53.8	132	20.5	75	13.0	9	3.7	216	14.8	5,731	48.9
Medical	226	79.2	115	30.7	25	8.8	366	38.7	27	20.5	28	16.7	6	5.9	61	15.2	427	31.7

Note: Rates are expressed as hospitalizations per 100,000 person-years.

servicemembers died during hospitalizations for assault-related injuries.

"Alcohol intoxication" (ICD-9 code: 303.0 or 305.0) was an additional diagnosis in 13.6% of all assault-related hospitalizations (compared to 1.7% of hospitalizations overall and 2.4% of all injury-related hospitalizations). More than half (58.4%) of servicemembers with assault-related hospitalizations in 1998 and 1999 had at least one ambulatory visit for "effects of acute alcohol intoxication" during the same period.

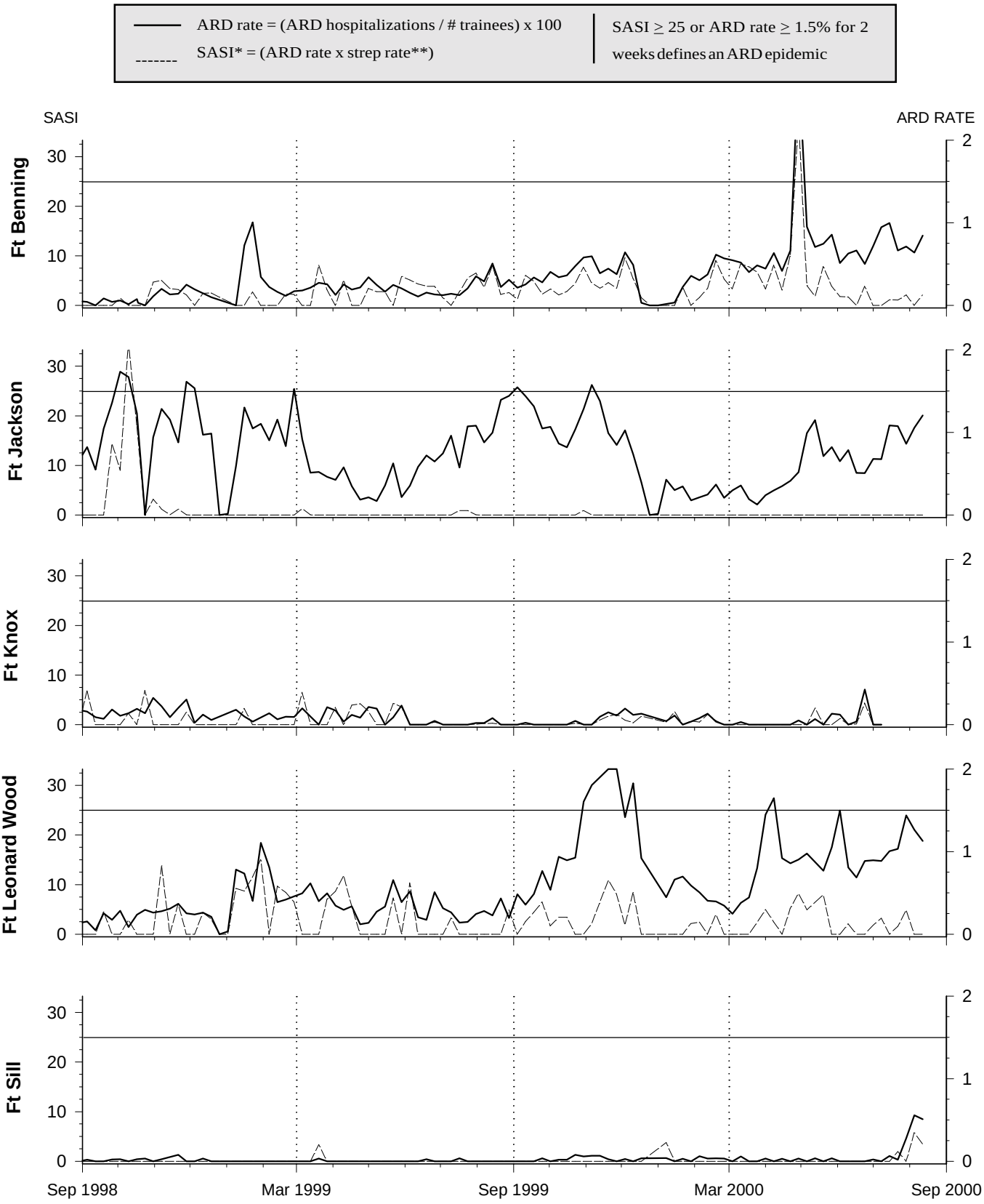
Crude rates of assault-related hospitalizations were approximately five times higher among men than women and markedly decreased with age (figure 1, page 11). In addition, crude rates were higher in the following subgroups compared to their counterparts: enlisted members (versus officers), combat-specific occupations (versus support and medical occupations), unmarried (versus married), and Marine Corps and Army (versus Air Force and Navy) (table 1).

Approximately half (49.7%) of all assault-related hospitalizations were for fractures (based on primary hospital discharge diagnoses). Open wounds (15.6%) and "concussions and other intracranial injuries" (13.3%) were the next most frequent diagnoses (figure 2, page 14).

Of fractures that were reported as primary diagnoses, more than three-fourths (n=3,318, 78.6%) were of the skull. Metacarpal fractures, the next most common type, were reported as primary diagnoses for 342 assault-related hospitalizations (figure 2) and as secondary diagnoses for an additional 35 hospitalizations. Finally, during calendar years 1998 and 1999, 88 (12.5%) of 705 assault-related hospitalizations were preceded by ambulatory visits of the same individuals for metacarpal bone fractures.

Editorial comment. This analysis documents that young male soldiers (compared to their counterparts in other branches of the military) are at relatively

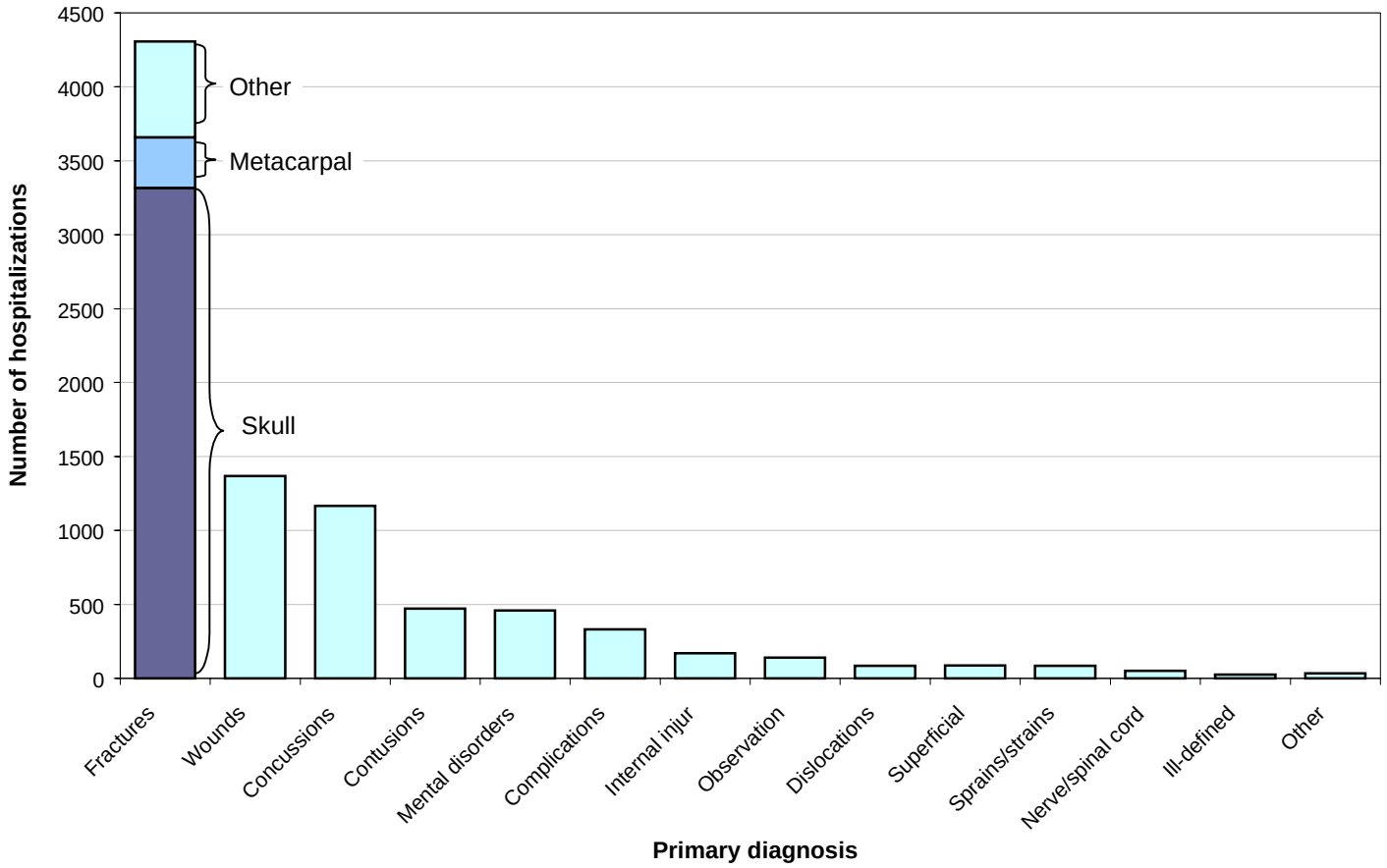
Figure II. Acute respiratory disease (ARD) surveillance update
US Army initial entry training centers



* SASI (Strep ARD Surveillance Index) is a reliable predictor of serious strep-related morbidity

** Strep rate = (Group A beta-hemolytic strep(+) / # cultures) x 100

Figure 2. Assault-related hospitalizations, by injury type (primary diagnosis), active duty, US Armed Forces, 1990-1999



high risk of incurring assault-related injuries that require hospitalization. Head injuries were the most common assault-related injuries that resulted in hospitalizations of servicemembers. Fatal outcomes were rare among assault victims who were hospitalized. Most servicemembers who were hospitalized for assault-related injuries returned to their military duties; however, nearly one-fourth were out of military service within 1 year after their hospitalizations. Finally, servicemembers who were hospitalized for assault-related injuries often had secondary diagnoses of or preceding outpatient encounters for alcohol intoxication or metacarpal bone fractures. Both have been reported as risk factors for recurrent injury.[2-4] Since there are not comparable data regarding the nature, spectrum, or rates of fighting-related injuries in US civilian populations, the military's experiences cannot be compared with those in nonmilitary populations and settings.

Research into human aggression has generally divided assaults into offensive and defensive categories: anger and fear are the predominant emotional responses in offenders and defenders, respectively.[8] For many habitually violent individuals, winning physical fights is associated with strongly positive emotions.[8] Such individuals may be more attracted than others to join the military service (particularly in combat-related occupations). On the other hand, individuals who have been exposed to violence are more likely than others to be violent. Recent surveys have found higher levels of exposures to and perpetrations of severe forms of violence among US high school students compared to US Army recruits.[9] Thus, it is unclear whether servicemembers are more prone to violence than their civilian counterparts.

In 1998 and 1999 among active duty servicemembers, there were 125,551 ambulatory visits for acute alcohol intoxication and 29,693 visits for metacarpal fractures. The proportion of these visits that were associated with physical fighting is unknown. Servicemembers who are treated for acute alcohol intoxication or metacarpal fractures (especially 5th metacarpal or "boxer's" fractures) as well as those who are involved in recurrent physical fights may be at increased risk for serious assault-related injuries.[1-5] Programs to reduce alcohol abuse may be the most practical and potentially useful interventions against assault-related injuries.

Analysis and report provided by Robert Allen Frommelt, MS, Analysis Group, Army Medical Surveillance Activity.

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Surveillance Trends

Allergic Rhinitis among Active Duty Servicemembers, 1998-1999

Allergic rhinitis, or hay fever, is the most common atopic disorder and the sixth leading cause of chronic illness in the United States. It is estimated that 10-25% of the US population[1,7] are affected by allergic rhinitis and more than $3.4 billion are spent annually on its evaluation and treatment.[1]

During 1998 and 1999, allergic rhinitis was the second most common respiratory-related diagnosis and the 16th most frequent diagnosis overall during outpatient visits of those on active duty. As such, it is a significant cause of morbidity and lost duty time, especially during spring and fall allergy seasons.

This report summarizes frequencies, rates, seasonal trends, and correlates of risk of allergic rhinitis among servicemembers during 1998 and 1999.

Methods. Cases were defined as ambulatory visits of active duty servicemembers during 1998 and 1999 for which allergic rhinitis (ICD-9-CM code 477) was a diagnosis. Cases were identified from Standard Ambulatory Data Records (SADR) maintained in the Defense Medical Surveillance System (DMSS). For this analysis, an incident case was defined as an individual's first ambulatory visit for allergic rhinitis during the study period.

Results. During 1998 and 1999, 91,799 active duty servicemembers had at least one outpatient diagnosis of allergic rhinitis. Allergic rhinitis accounted for 183,812 ambulatory visits overall, and the crude incidence rate was 30.8 per 1,000 person-years. For most cases, the presumed precipitating agent (i.e., pollen or other allergen) was not specified.

Approximately 30% of cases had more than one allergic rhinitis visit during the period. Among servicemembers with multiple visits, the mean was 4.3 and the maximum was 112.

Rates of allergic rhinitis generally increased with age, rank, and educational attainment (table 1). In addition, rates were higher in the Air Force and among females in comparison to their respective counterparts (table 1).

Throughout the period, there were distinct seasonal trends in the incidence of allergic rhinitis. Specifically, each year in relation to mid-winter baseline rates, there were large spring and smaller fall outbreaks (figure 1). During each spring outbreak, rates sharply increased in March and peaked in April and May. During each fall outbreak, rates slightly increased in August and peaked in September. In general, spring peaks were approximately twice as high above winter baselines as fall peaks. Seasonal trends in gender- and age-defined subgroups reflected the overall trend (figure 2, page 18).

Editorial comment. Allergic rhinitis, or hay fever, is the clinical manifestation of a hypersensitive

Figure 1. Allergic rhinitis ambulatory visits by month, active duty servicemembers, 1998-1999

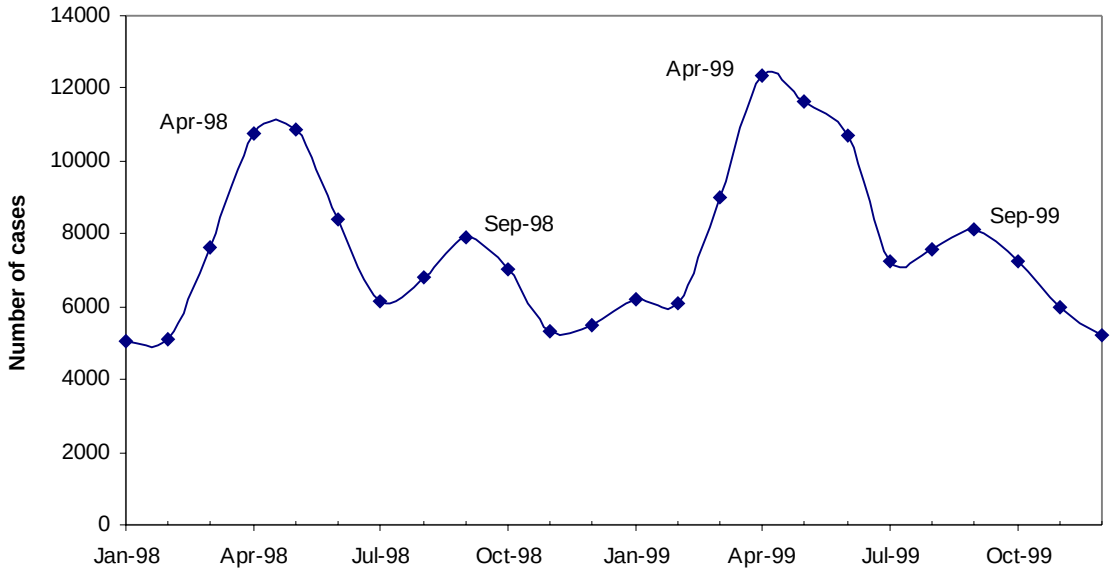


Table 1. Allergic rhinitis ambulatory visits and rates, active duty servicemembers, 1998-1999

Characteristics	Incident cases	Rate per 1,000 person-years
Total	91,799	30.8
Service		
Air Force	43,814	59.1
Army	27,700	28.8
Navy	15,632	18.6
Marines	4,653	13.5
Gender		
Female	24,338	61.7
Male	67,460	27.1
Race/ethnicity		
Other	1,999	40.4
Black	19,728	35.9
Asian	3,351	35.6
White	60,048	32.8
Hispanic	6,012	30.1
Indian	651	29.2
unknown	10	13.1
Age group		
<20	4,935	21.8
20-24	21,470	24.8
25-29	19,579	31.9
30-34	16,188	33.2
35-39	17,049	40.4
>39	12,578	46.8
Grade		
E1-E4	34,763	27.2
E5-E9	39,779	34.8
O1-O3, W1-W3	9,635	33.4
O4-O9, W4-W5	7,622	43.0
Education		
Some college or more	54,618	51.4
H.S. diploma or less	36,391	22.0
Unknown	790	23.6

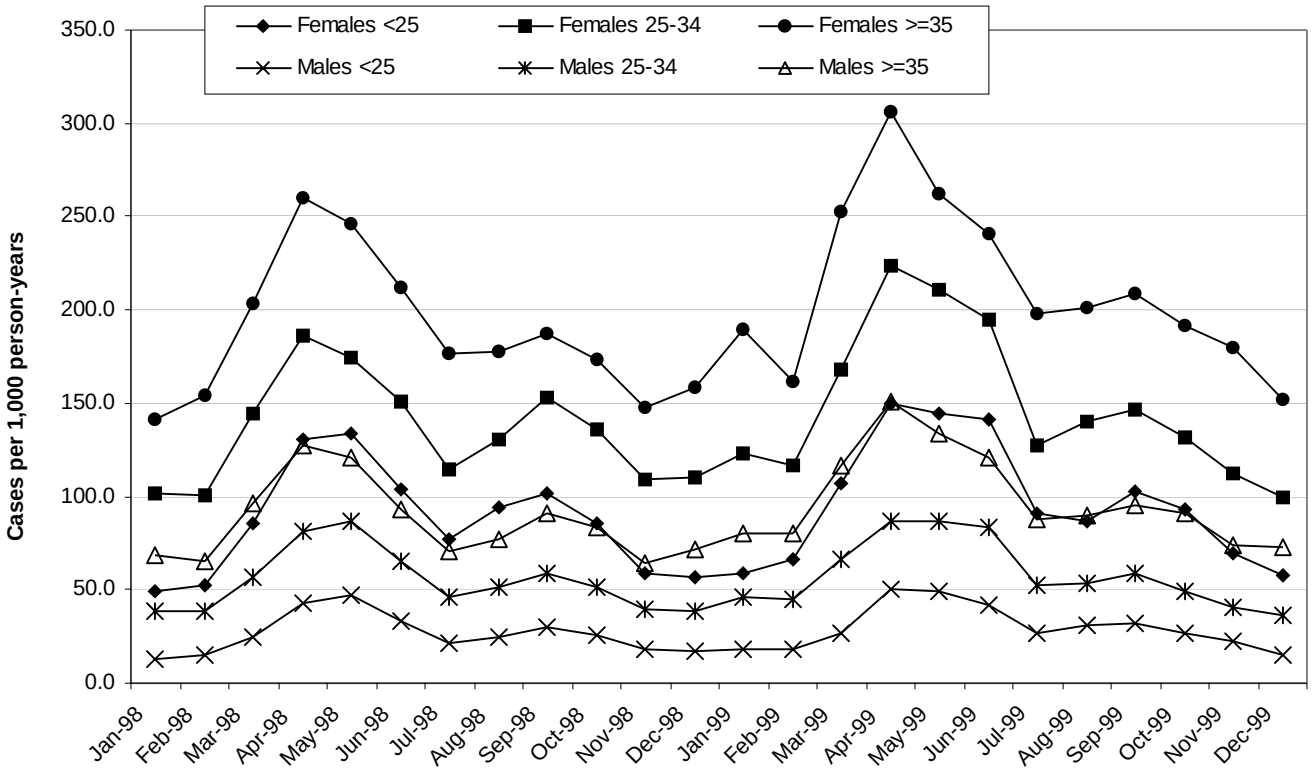
reaction to an airborne substance that results in the release of histamine. Signs and symptoms include itchy, runny, and stuffy nose, itchy and watery eyes, nasal and sinus obstruction, and sneezing. Complications such as sinus infections also may occur. Allergic rhinitis can be difficult and time consuming to clinically manage. It is not surprising therefore that it is one of the leading causes of outpatient visits among servicemembers, particularly in spring and fall.

Allergic rhinitis is generally classified as seasonal or perennial. Seasonal allergic rhinitis is generally caused by pollens of trees, grasses, and weeds. Perennial allergic rhinitis is often associated with dust mites, mold spores, animal danders, and cockroaches. Although the types and presumed causes of military cases are not routinely reported, the seasonal trends are generally consistent with reported estimates that seasonal rhinitis is twice as common as perennial rhinitis.[2,3]

Studies in civilian populations have estimated that allergic rhinitis incidence has increased during the past 20 years.[1] It is unclear, however, whether these apparent long term increases reflect true increases in rates of symptomatic illness and/or changes in access to or utilization of health care services. During the relatively short period of this study, there were no clear changes in incidence rates or seasonal trends.

In this analysis, rates of allergic rhinitis were higher among older and more educated servicemembers as well as among women and mem-

Figure 2. Incidence of allergic rhinitis by age, gender, and month, active duty servicemembers, 1998-1999



bers of the Air Force. Studies in civilian populations have generally found no differences between males and females; [7,10] otherwise, the findings of this study are generally consistent with those of other studies.[1,6,7] Risk factors reported in other studies but not examined in this analysis include family history of allergies,[1,8,11] early exposure to allergens (before 1 year of age), month of birth (spring and summer), geographic location (dry), and prior onset of asthma or atopic dermatitis.[1]

In general, the successful management of clinically significant allergic rhinitis depends on the identification of allergens that trigger allergic reactions and activities and settings that lead to significant exposures.[6] The management of allergic rhinitis in military settings can be particularly difficult, however. For example, during military careers, servicemembers are stationed or may be deployed to many different regions of the US and overseas. The allergens and activities that precipitate symptomatic attacks can vary from location to location. In addition, military operational considerations may limit or eliminate options for avoiding significant indoor (e.g., barracks) and outdoor (e.g., field training exercises) allergen exposures. In general, however, better understanding of causal factors of allergic diseases, such as allergic rhinitis, can lead to more effective clinical management, decreased discomfort and disability, and improved quality of life.

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Table S2. Active duty force strength by MTF, United States Army, April 2000[1]

MTF/Post[2]	Males							Females							All
	< 20	20-24	25-29	30-34	35-39	>= 40	Total M	< 20	20-24	25-29	30-34	35-39	>= 40	Total F	
NORTH ATLANTIC RMC															
Walter Reed AMC	145	2145	1951	1662	1854	3137	10894	54	558	685	510	514	629	2950	13844
Aberdeen Prov. Ground, MD	464	604	302	324	374	339	2407	68	96	71	58	40	44	377	2784
FT Belvoir, VA	12	197	256	275	328	393	1461	9	63	117	75	70	86	420	1881
FT Bragg, NC	2048	11514	7919	5824	4339	2397	34041	274	1640	1157	657	459	239	4426	38467
FT Drum, NY	656	3813	2293	1397	1051	514	9724	135	448	243	150	102	52	1130	10854
FT Eustis, VA	670	1714	1222	966	944	807	6323	176	526	318	193	166	123	1502	7825
FT Knox, KY	1227	3138	1759	1341	1370	800	9635	46	248	201	145	112	67	819	10454
FT Lee, VA	589	963	615	544	471	393	3575	436	484	267	169	132	96	1584	5159
FT Meade, MD	105	713	810	799	654	804	3885	42	285	251	218	160	130	1086	4971
West Point, NY	18	234	225	567	506	526	2076	8	61	65	98	70	71	373	2449
GREAT PLAINS RMC															
Brooke AMC	280	763	912	951	824	952	4682	260	458	399	363	305	301	2086	6768
Wm Beaumont AMC	494	2337	1770	1284	1214	1130	8229	129	609	405	217	185	163	1708	9937
FT Carson, CO	652	4379	3160	2022	1529	842	12584	122	680	404	210	161	95	1672	14256
FT Hood, TX	2607	13147	8317	5307	3900	2170	35448	567	2341	1495	848	608	361	6220	41668
FT Huachuca, AZ	544	1217	932	609	547	407	4256	171	366	210	118	88	97	1050	5306
FT Leavenworth, KS	42	249	218	421	834	530	2294	17	71	48	62	100	60	358	2652
FT Leonard Wood, MO	1482	2204	1298	1205	1034	594	7817	614	753	383	233	154	89	2226	10043
FT Polk, LA	543	2595	1572	1332	827	384	7253	103	449	266	139	85	76	1118	8371
FT Riley, KS	765	3729	2143	1311	959	483	9390	91	413	242	148	110	65	1069	10459
FT Sill, OK	1566	3966	2266	1603	1244	740	11385	278	520	339	215	123	63	1538	12923
SOUTHEAST RMC															
Eisenhower AMC	1427	1990	1490	1137	1118	1161	8323	253	577	446	345	308	251	2180	10503
FT Benning, GA	3500	6180	3443	2203	1487	757	17570	95	498	362	219	159	84	1417	18987
FT Campbell, KY	1350	7394	5270	3476	2350	1160	21000	217	1024	693	354	220	104	2612	23612
FT Jackson, SC	1665	2136	1024	954	772	452	7003	1114	1214	557	347	192	95	3519	10522
FT McClellan, AL	161	149	110	152	211	225	1008	32	47	30	35	30	30	204	1212
FT Rucker, AL	120	685	1043	601	521	426	3396	62	186	157	75	47	31	558	3954
FT Stewart, GA	1361	6242	3951	2396	1829	917	16696	202	1092	667	390	261	144	2756	19452
WESTERN RMC															
Madigan AMC	1271	5228	3611	2488	1971	1319	15888	300	996	632	365	250	204	2747	18635
FT Irwin, CA	183	1459	987	729	556	285	4199	25	189	125	84	50	27	500	4699
FT Wainwright, AK	429	1862	1544	820	528	313	5496	71	336	224	143	106	46	926	6422
OTHER LOCATIONS															
Tripler AMC	798	4086	3346	1977	1485	961	12653	155	820	711	375	255	195	2511	15164
Europe	647	9769	10056	6521	4849	3522	35364	163	2044	1685	979	763	500	6134	41498
Korea	291	2754	2442	1798	1681	1437	10403	62	492	470	311	279	186	1800	12203
Other/Unknown	4329	13047	10599	10803	9575	5616	53969	1123	2710	1833	1491	1207	724	9088	63079
Total	32441	122602	88856	65799	53736	36893	400327	7474	23294	16158	10339	7871	5528	70664[§]	471013[§]

1. Based on duty zip code. Does not account for TDY.

2. Includes any subordinate catchment areas not listed separately.

§ Includes unknown age groups and unknown gender.

Source: Defense Manpower Data Center.

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